Attorney Docket No. 47121-5018-00-US
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of:	)	
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Markku KESKINIVA et al.	)	Confirmation No.: 3523
	)	
Application No.: 10/563,821	)	Group Art Unit: 3721
	)	
Filed: January 6, 2006	)	Examiner: Lopez, Michelle
	)	
FOR: IMPACT DEVICE AND METHOD FOR GENERATING STRESS PULSE THEREIN	)))	

APPEAL BRIEF

Mail Stop: APPEAL BRIEF-PATENTS
Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

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I. Real Party in Interest

The real party in interest is the assignee of record, SANDVIK MINING AND CONSTRUCTION OY by Change of Name document assignment filed January 27, 2009.

II. Related Appeals and Interferences

There are no related appeals or interferences which would have a bearing on the Board's decision in this appeal.

III. Status of Claims

Claims 1-33 have been finally rejected and are the subject of this Appeal.

IV. Status of Amendments

On November 20, 2008, Applicants submitted an Amendment After Final, including an amendment to Claim 1. In an Advisory Action dated December 19, 2008, the Examiner indicated the amendments will be entered upon filing a Notice of Appeal.

V. Summary of Claimed Subject Matter

Independent Claim 1 recites a pressure fluid operated impact device 1 (FIG. 1 and paragraph [0019]) comprising a frame 2 whereto a tool 3 is mountable movably in its longitudinal direction (FIG. 1 and paragraph [0019]), control means 7 for controlling pressure fluid feed of the impact device 1 (FIG. 1 and paragraph [0019]), and means for generating a stress pulse in the tool 1 by the pressure of a pressure fluid (FIG. 1 and paragraph [0020]), the

impact device 1 comprises a working chamber 8 entirely filled with pressure fluid and, in the working chamber 8 (FIG. 1 and paragraph [0019]), a transmission piston 9 movably mounted in the longitudinal direction of the tool 1 with respect to the frame 2 (FIG. 1 and paragraph [0019]), an end of the transmission piston 9 facing the tool 3 coming into contact with the tool 3 either directly or indirectly (paragraph [0020]- indirectly through a separate connecting piece) at least during the generation of the stress pulse, the transmission piston 9, in its axial direction with respect to the tool 3 on the opposite side thereof, being provided with a pressure surface 9a located towards the working chamber 8 (FIG. 1 and paragraph [0020]); the impact device 1 comprises energy charging means 4 for charging energy of the pressure fluid to be fed to the impact device 1 necessary for generating the stress pulse (FIG. 1 and paragraph [0020]), and in that the control means 7 are configured to allow periodically and alternately a pressure fluid having a pressure higher than the pressure of the pressure fluid present in the working chamber 8 to flow to the working chamber 8 (FIG. 1 and paragraph [0020]), thus causing a sudden increase in the pressure in the working chamber 8 and, consequently, a force F pushing the transmission piston 9 in the direction of the tool 3, compressing the tool 3 in the longitudinal direction and thus generating a stress pulse in the tool 3, the generation of the stress pulse ending substantially at the same time as the influence of the force F on the tool 3 ends (FIG. 1 and paragraph [0020]), and, correspondingly, to discharge pressure fluid from the working chamber 8 in order to enable the transmission piston 9 to return to its substantially original position (FIG. 1 and paragraph [0021]).

Independent Claim 1 recites “control means for controlling pressure fluid feed of the impact device”. The control means is simply the control valve 7 which directs and controls

pressure fluid between an energy charging space 4 and the working chamber 8 (FIG. 1 and paragraphs [0019] and [0020]).

Independent Claim 1 recites "means for generating a stress pulse in the tool by the pressure of a pressure fluid" and "energy charging means for charging energy of the pressure fluid to be fed to the impact device necessary for generating the stress pulse". The means for generating a stress pulse includes a pressure device which is capable of filling an energy charging space 4 with fluid (see, e.g., paragraph [0019] via a hydraulic accumulator or pressure fluid tank) and then directing it to a working chamber 8 in a manner that causes a sudden increase in pressure. The energy charging means is the energy charging space 4 itself, which charges the energy of the pressure fluid to be fed to the impact device, which is necessary for generating the stress pulse (FIG. 1 and paragraph [0020]).

VI. Ground of Rejection to be Reviewed on Appeal

Whether independent Claim 1 is anticipated by U.S. Patent No. 4,102,408 to *Ludvigson.*

VII. Argument

Independent Claim 1 defines a pressure fluid operated impact device comprising a frame whereto a tool is mountable movably in its longitudinal direction, control means for controlling pressure fluid feed by the impact device, and means for generating a stress pulse in the tool by the pressure of a pressure fluid, wherein the impact device comprises a working chamber entirely filled with pressure fluid and, in the working chamber, a transmission piston movably mounted in the longitudinal direction of the tool with respect to the frame, an end of the transmission

piston facing the tool coming into contact with the tool either directly or indirectly at least during the generation of the stress pulse, the transmission piston, in its axial direction with respect to the tool on the opposite side thereof, being provided with a pressure surface located towards the working chamber, the impact device comprises energy charging means for charging energy of the pressure fluid to be fed to the impact device necessary for generating the stress pulse, and in that the control means are configured to allow periodically and alternately a pressure fluid having a pressure higher than the pressure of the pressure fluid present in the working chamber to flow to the working chamber, thus causing a sudden increase in the pressure in the working chamber and, consequently, a force pushing the transmission piston in the direction of the tool, compressing the tool in the longitudinal direction and thus generating a stress pulse in the tool, the generation of the stress pulse ending substantially at the same time as the influence of the force on the tool ends, and, correspondingly, to discharge pressure fluid from the working chamber in order to enable the transmission piston to return to its substantially original position. None of the art of record discloses these patentable features.

Ludvigson discloses a gas cushion impact cap used in connection with pile driving, and not an impact device as claimed. In particular, *Ludvigson* discloses a hammer integral with an impact cap 10 for pile driving. The end of the pile 11 is hammered by the hammer. The impact cap 10 has a piston 13. As noted in column 3, lines 8-11 of *Ludvigson*, the chamber in cylinder 12, above piston 13, is filled with pressurized gas, and the piston is, in its most forward position, supported by an annular member 25 of resilient material. A stroke at the end of the pile causes the gas in chamber 12 to be compressed. The compressed gas again tries to push piston 13 towards the pile which increases a driving of the pile.

In *Ludvigson*, the hammer and the impact cap strikes against the end of the pile together with piston 13. Piston 13 is not in contact with the pile before the stroke and the impact is created only by the hit of the hammer and the impact cap with the piston against the pile. The gas space behind piston 13 is only a damper which allows a smoother contact to the end of the pile and some longer pushing force to the end of the pile. The pressure behind piston 13 is not changed during the operation. The stress pulse to the pile is not created by setting piston 13 under the influence of pressure, but rather by hitting the pile with the hammer.

In contrast, according to the features of the claimed invention, the piston is directly or indirectly in contact with tool when a pressure pulse of pressure fluid is set to affect the piston. As such, the force created by the pressure pulse compresses the tool and thus creates a stress pulse in it. In *Ludvigson*, there is always a substantially same pressure behind the piston 13 and no pressure pulses.

In addition, independent Claim 1 recites an energy charging means for charging energy of the pressure fluid, from which the pressure fluid having high pressure is periodically allowed to affect the piston and alternately the pressure behind piston is allowed to be released. In *Ludvigson*, this kind of periodical pressurizing and depressurizing of the cylinder behind the piston does not happen.

As such, *Ludvigson* uses the hammer to strike the pile and the gas chamber behind the piston is only a damper. The stress pulses to the pile is not created by suddenly increasing the pressure behind the piston 13, since before meeting pile 11, piston 13 is in its foremost position because of the pressure behind it. Thus, increasing the pressure behind piston 13 cannot create

the stress pulse to the pile 11 since piston 13 cannot move more forward in relation to the body 10 from its foremost position.

Column 4, lines 54-61 of *Ludvigson* demonstrate this point precisely. As described therein,

> The pressure in chamber 32 (as shown in FIG. 3) will be considerably reduced when the hammer reaches the pile. When the hammer, due to the expansion of gas within cylinder 12 is thrown upwards- that magnitude of such movements is determined by the pre-load previously imparted to the impact cap- pressure fluid is again introduced into chamber 32, i.e. while the hammer is still moving upwards, and is *separated* from the pile (emphasis added).

According to the features of *Ludvigson*, the hammer and piston are not connected to the pile (which the Examiner equates to the claimed tool) during the generation of the stress pulse. Rather, as specified above, the hammer and pile are disconnected during the generation of the stress pulse, which causes the hammer to move away from the pile. Thus, *Ludvigson* fails to disclose the patentable features of independent Claim 1.

Accordingly, Applicants respectfully submit that the final rejection of the Examiner be reversed.

Respectfully Submitted,

Date: March 11, 2009

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VIII. CLAIMS APPENDIX

The Appealed Claims

1. A pressure fluid operated impact device comprising a frame whereto a tool is mountable movably in its longitudinal direction, control means for controlling pressure fluid feed of the impact device, and means for generating a stress pulse in the tool by the pressure of a pressure fluid, wherein

the impact device comprises a working chamber entirely filled with pressure fluid and, in the working chamber, a transmission piston movably mounted in the longitudinal direction of the tool with respect to the frame, an end of the transmission piston facing the tool coming into contact with the tool either directly or indirectly at least during the generation of the stress pulse, the transmission piston, in its axial direction with respect to the tool on the opposite side thereof, being provided with a pressure surface located towards the working chamber,

the impact device comprises energy charging means for charging energy of the pressure fluid to be fed to the impact device necessary for generating the stress pulse, and in that the control means are configured to allow periodically and alternately a pressure fluid having a pressure higher than the pressure of the pressure fluid present in the working chamber to flow to the working chamber, thus causing a sudden increase in the pressure in the working chamber and, consequently, a force pushing the transmission piston in the direction of the tool, compressing the tool in the longitudinal direction and thus generating a stress pulse in the tool, the generation of the stress pulse ending substantially at the same time as the influence of the force on the tool ends, and, correspondingly, to discharge pressure fluid from the working chamber in order to enable the transmission piston to return to its substantially original position.

2. An impact device as claimed in claim 1, wherein in order to stop the influence of the force, the control means are configured to prevent pressure fluid from entering the working chamber.

3. An impact device as claimed in claim 1, wherein the control means are configured to stop the influence of the force by discharging pressure fluid from the working chamber.

4. An impact device as claimed in claim 1, further comprising stop elements for stopping the movement of the transmission piston in the direction of the tool such that the influence of the force on the tool ends.

5. An impact device as claimed in claim 1, wherein the impact device, as an energy charging means, comprises an energy charging space which is entirely filled with pressurized pressure fluid and whose volume is substantially large as compared with the volume of a pressure fluid amount to be fed to the working chamber during the generation of one stress pulse.

6. An impact device as claimed in claim 5, wherein when the impact device is in operation, pressure fluid is fed to the energy charging space such that a predetermined pressure level is maintained in the energy charging space, and that the control means are configured to allow periodically and alternately pressure fluid to flow from the energy charging space to the

working chamber and, consequently, to close the connection between the energy charging space and the working chamber.

7. An impact device as claimed in claim 1, wherein the control means comprise a rotating control valve comprising a plurality of successive openings in the direction of rotation thereof in order to feed pressure fluid from an energy charging space via a plurality of feed channels to the working chamber simultaneously.

8. An impact device as claimed in claim 7, wherein the length and cross-section of each feed channel are mutually the same.

9. An impact device as claimed in claim 1, further comprising at least two feed channels which differ in length or cross-sectional area or both and which lead from an energy charging space to the working chamber.

10. An impact device as claimed in claim 9, further comprising at least one valve to activate and deactivate the feed channels differing in length and/or cross-sectional area.

11. An impact device as claimed in claim 1, wherein a length of at least one feed channel from an energy charging space to the working chamber is adjustable.

12. An impact device as claimed in claim 5, wherein the energy charging space is a tank whose walls, due to the influence of pressure, yield such that the volume of the energy charging space increases as pressure increases.

13. An impact device as claimed in claim 5, wherein the energy charging space is a tank separate from the frame.

14. An impact device as claimed in claim 5, wherein at least one energy charging space is a hydraulic accumulator.

15. An impact device as claimed in claim 1, wherein the transmission piston is a membrane type piston.

16. An impact device as claimed in claim 1, wherein the feed force of the impact device is used for pushing the transmission piston back to its pre-stress-pulse position.

17. An impact device as claimed in claim 1, further comprising means for returning the transmission piston after an impact to its pre-impact position with respect to the impact device by bringing a separate force acting between the impact device and the transmission piston to influence the transmission piston, the force pushing the transmission piston towards the working chamber.

18. An impact device as claimed in claim 1, wherein the length of movement of the transmission piston in the working chamber is at least one millimeter.

19. A method of generating a stress pulse in a pressure fluid operated impact device as claimed in claim 1, wherein a pressure fluid having a pressure higher than the pressure of the pressure fluid present in the working chamber is fed to a working chamber of the impact device, the working chamber being entirely filled with pressure fluid, which, as a result of a sudden increase in the pressure in the working chamber produces a force pushing the transmission piston in the direction of the tool, compressing the tool in the longitudinal direction and thus generating a stress pulse in the tool, the generation of the stress pulse ending substantially at the same time as the influence of the force on the tool ends, and, correspondingly, to discharge pressure fluid from the working chamber in order to enable the transmission piston to return to its substantially original position.

20. A method as claimed in claim 19, wherein as an energy charging means, an energy charging space which is entirely filled with pressurized pressure fluid and whose volume is substantially large as compared with the volume of a pressure fluid amount to be fed to the working chamber during the generation of one stress pulse.

21. A method as claimed in claim 20, wherein when the impact device is in operation, pressure fluid is fed to the energy charging space such that a predetermined pressure level is maintained in the energy charging space, and that the control means are coupled to allow

periodically and alternately pressure fluid to flow from the energy charging space to the working chamber and, consequently, to close the connection between the energy charging space and the working chamber.

22. A method as claimed in claim 19, wherein a rotating control valve is used as a control means, comprising a plurality of successive openings in the direction of rotation thereof in order to feed pressure fluid from an energy charging space via a plurality of feed channels to the working chamber simultaneously.

23. A method as claimed in claim 19, wherein pressure fluid is fed from an energy charging space to the working chamber via at least two feed channels which are mutually the same in length and/or cross-sectional area.

24. A method as claimed in claim 19, wherein pressure fluid is fed from an energy charging space to the working chamber via at least two feed channels which differ in length and/or cross-sectional area.

25. A method as claimed in claim 24, wherein for adjustment of properties of a stress signal, feed channels which differ in length and/or cross-sectional area are activated and deactivated.

26. A method as claimed in claim 19, wherein a length of at least one feed channel from an energy charging space to the working chamber is adjustable.

27. A method as claimed in claim 19, wherein as the energy charging space , a tank is used whose walls, due to the influence of pressure, yield such that the volume of the energy charging space increases as pressure increases.

28. A method as claimed in claim 19, wherein as the energy charging space, a tank separate from the frame is used.

29. A method as claimed in claim 19, wherein as at least one energy charging space, a hydraulic accumulator is used.

30. A method as claimed in claim 19, wherein as the transmission piston, a membrane type piston is used.

31. A method as claimed in claim 19, wherein the transmission piston is pushed back to its pre-stress-pulse position by using the feed force of the impact device.

32. A method as claimed in claim 19, wherein for returning the transmission piston after an impact to its pre-impact position with respect to the impact device, a separate force acting

between the impact device and the transmission piston is arranged to influence the transmission piston, the force pushing the transmission piston towards the working chamber.

33. A method as claimed in claim 19, wherein when generating a stress pulse, the transmission piston is moved for at least one millimeter in the working chamber.

IX. EVIDENCE APPENDIX- (NONE)

X. RELATED PROCEEDINGS APPENDIX – (NONE)